

## **VIRGINIA GIS REFERENCE BOOK**

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**General Application Category/Sub Application Name:** Economic Development

**Product /Service/Function Name:** Available Building & Site Inventory

**P/S/F/ Description:** An available building and site inventory application should enable local economic development partnerships and entities to distribute and share available site and building inventory information with prospective businesses, either directly or indirectly, that may wish to relocate or move operations into the area. The application should be capable of presenting graphical and textual information about the availability, location, size, ownership, facility services, and other pertinent facility information required by prospective businesses to make an operations location/relocation decision. Quick dissemination of this information to business prospects in an interactive and dynamic manner that includes mapping information is the focus of this type of application.

### **Product /Service/Function**

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#### **Spatial Data:**

In order to effectively present the specific location and setting of an available building or site, spatial data about the facility, the surrounding environment, the supporting infrastructure, and the area demographics will be needed.

- Minimum Requirements:  
The minimum requirements for an available building and site inventory application will vary between localities based on the programs, agencies and resources available to support the overall process. How the potential business is approached, who interacts and what information they provide, how and when the application is used to locate potential sites, and how that information is presented will all play into the overall design and will help determine the “minimal” requirements for the application for that community.

*For this document, the minimal requirements are those that enable a local employee with GIS experience to perform a basic search against locally stored data that define the basic required information for the application, as described in the P/S/F/Description, but enable all the questions to be answered from the data's content. The search and the results of the search are performed and presented by a local representative, and the application is not directly available to the inquiring businesses. This assumes this as the only use of this application and that it is only used by one agency/entity. Basic Process: The employee receives the required parameters, formulates a query against the data, and*

*creates graphical and textural results showing and describing the spatial characteristics of the building/site.*

Site/property data – This is vector based area data and represents the property boundaries of the site, whether a building exists or not, where each property is uniquely identified and is attributed with information including:

unique property ID	owner name	electric service
property name	owner address	water service
property address	owner phone number	sewer service
availability	listing type (rent or sale)	road access
vacancy status	price (optional)	rail access
parcel size	zoning	water access
property relief (sloped?)	current/latest use	physical water features
structures	previous use	known hazards
structure types (office?)		

If applicable, specific location and setting of an available building or site, spatial data about the facility, the surrounding environment, the supporting infrastructure, and the area demographics can be utilized

At a minimum, a functioning application that provides a basic level of useful information to the target users will need to have spatial data layers of geographically referenced point locations for available buildings and polygon areas for available sites within the region. Additionally, a base spatial data layer will be needed to provide a frame of reference for the desired region. The VBMP orthophotography product will be an excellent base spatial layer that can be utilized. If the above spatial layers are not already compiled then they will need to be created or developed using standard GIS data collection and development processes. All spatial data will need to be in the same coordinate system, projection and file formats.

Optional Requirements: Additional spatial data layers will enhance the overall usefulness of the GIS. Optional spatial data could include framework data layers such as railroads, roads, hydrology, utilities, environmental boundaries, easements, airports and schools to name a few. Building footprint polygons could be generated instead of points. Multiple base map layers such as digital raster graphics (DRGs) from the USGS or digital elevation model graphics (DEMs) may be added as base map layers in order to convey additional information to the user.

### **Attribute Data**

Attribute data are characteristics of a geographic features described by numbers, characters, images or drawings, typically stored in a tabular format and linked to the feature by a user-assigned identifier. In most basic terms attribute data are tabular data in a database structure that link to and hold additional information about corresponding spatial data.

Attribute data will generally be in two forms. One form will be tabular data in a “.dbf” file format which is a component of the ESRI shape file set. These spatial data are typically and best limited to unique identifier column and columns that hold pertinent spatial information such as lat/long information or X/Y positions. Additional attribute information should be housed in a separate typical database structure (ASCII text file, spreadsheet, database) that ties to the unique identifier of the records in the shape file “.dbf”. These data can contain all additional information that is needed or desired to convey information about a particular spatial element. All data structures and naming conventions should be in standard ANSI formats.

- **Minimum Requirements:** At a minimum, typical real estate type data should be collected for all sites and buildings being offered. Typical data to be collected for buildings will include square feet of facility, facility use, address, special features, utilities and telecommunications, taxes, zoning, and unique characteristics. Typical data to be collected for sites will include acreage of property, easements, address/location, zoning, topology indicator, road or water frontage, taxes, utilities and telecommunications available at site and special or unique features. Both building and site data should include contact information for additional information requests.
- **Optional Requirements:** Optional attribute information can be almost infinite in scope. These attributes may include private information not used for public consumptions such as price of building or site, realtor comments, repair histories, past ownership and tax assessments to name a few.

### **Data Acquisition Options (integrated with VBMP digital orthos):**

Data acquisition will basically be divided into two categories for an organization. The first is to collect and develop data “in-house.” Another category is acquiring data that have already been developed. Where possible, acquiring data that have already been developed will be the desired model. Spatial data collection will need to be done with the use of field personnel and GPS equipment or possibly a survey team. Spatial data acquisition should be conducted by utilizing the wealth of spatial data resources currently available at various local, state and national levels. This includes, but is not limited to, the Virginia Geographic Information Network (VGIN), The Virginia Economic Development Partnership (VEDP), and the USGS. For an economic development application, the majority of framework data layers will be available from VEDP which has devoted substantial resources to amass an extensive collection of spatial data that may be of importance to economic development efforts for any locality. Tabular or attribute data collection will be handled best by performing research and compiling data. This will include data entry for information attributes to be used within the system. Possible sources of information collection could include local and regional MLS records, zoning records, tax records, and other publicly available data concerning buildings and sites within the region.

The VBMP digital orthophotography will be one of the best sources for the spatial base map layer. This will be available through arrangements with the Virginia Geographic Information Network. Other possible base map layers may include raster spatial data from VEDP and USGS.

### **Data Conflation Options (integrated with VBMP digital orthos):**

Conflation is the method whereby a geographic feature is adjusted to fit a more accurate base map. This process can occur in variety of ways, with the least sophisticated being a “best-fit” methodology. The best-fit method is a visual inspection or comparison of a geographic feature’s current position to where it is or should be located on the more accurate base map.

Another conflation option includes rubber sheeting, a method using control points or existing boundaries to establish the new geographic position of a feature. Finally, the most accurate method of conflating data includes the use of Global Positioning Satellite technology (GPS), or traditional survey instruments to accurately locate an objects physical location.

### **GUI / Programming Options:**

A GUI or graphical user interface is a graphical method of controlling how a user interacts with a computer to perform various tasks. Instead of issuing commands at a prompt, the user performs desired tasks by using a mouse to choose from ‘a dashboard’ of options presented on the display screen. These are in the form of pictorial buttons (icons) and lists. Some GUI tools are dynamic and the user must manipulate a graphical object on the screen to invoke a function; for example, moving a slider bar to set a parameter value (e.g., setting the scale of a map). (Definition from ESRI)

There are two main avenues to develop an application and GUI for your GIS data. An application can be stand alone or distributed.

Stand-alone applications are typically built by programming modules, scripts and add-ins to perform specific analysis that are extensions of desktop GIS software packages such as ArcView, ArcInfo or AutoCAD.

Another desktop method would be to program a GUI and application from scratch utilizing a programming language and suite such as MS Visual Basic, FoxPro or C++ and a third party GIS programming suite such as ESRI Map Objects. Workstation based or stand-alone applications are usually developed to perform specific higher-end functions for a user that has a working knowledge of GIS systems.

Typically a distributed application will be shared across an intranet or the Internet with the user utilizing a thin client such as a browser. An Internet based application will typically utilize a mix of languages to create a finished product. These languages can

include HTML, Java, JavaScript, XML, AXL, Pearl, PHP, JSP, Cold Fusion or MS ASP. Specific knowledge a map server software package such as ESRI's ArcIMS or AutoDesk's Mapguide will be required.

## **Internet Functionality and Options**

Internet delivery and functionality would be very important to this application. One of the goals of economic development entities is to attract new business and industry into the region. Providing a site and building inventory application over the internet that is accessible to all potential and prospective companies that are looking for a location is crucial. Internet functionality should include basic GIS functions available in a thin client GIS application, such as ESRI's ArcExplorer (i.e. Zoom In, Zoom Out, Pan, Identify, Query, Thematic Mapping ... etc.).

Additional functionality may include appropriate hyperlinks to critical and related information on the Internet related to certain queries or operations within the application. A dedicated "needs based" approach to determine user interface options and functionality is highly recommended before actual application work is to begin. There are many internet based map server technologies available on the market today and great care should be taken to evaluate the different options when selecting the software and programming language option that will be utilized for your application.

## **Technical Requirements**

Technical requirements will vary greatly depending on whether the application programming, development and hosting functions are in-house or if the functions are outsourced to a GIS applications development and hosting firm. Obviously, the situation that would require the least amount of technical requirements and resources would be to outsource to a firm that already has all the technical requirements and experience in place. However, for the purposes of this paper, we will assume that all of the development and hosting will occur in-house. Some of the resources listed below may already be within the existing pool of resources at some organizations, others will not.

- Minimum: The application should be developed on a dedicated development computer. A dedicated development computer is important because during the development process, it is often necessary to reboot the computer and try different configurations on a regular basis and this would adversely affect any other uses of the computer. When it is time to serve the application out to an audience, it is recommended that a dedicated production server be implemented. This will insure that other organizational applications, and uses do not interfere with the operation of the map server.

If the application is to be a distributed or shared application, additional hardware will be needed as by product of serving the application to multiple users. For an

intranet application you will need all of the typical hardware in a network environment including (cabling, hubs, switches, network cards ... etc.). If the application is to be distributed over the Internet then hardware requirements will be expanded to include a CSU/DSU, router, and possibly a firewall appliance. If dedicated high-speed Internet access is not already in place, then it will need to be installed.

Required software will include an operating system software package, a web server software package, map server software package, a middleware software package, and back-up software package, enterprise level database software package, programming editor software package, and a mid-level desktop GIS software package.

- Optimum: The main differences between minimum technical requirements and optimum technical requirements will be mainly in redundancy in hardware and connectivity areas. Two is better than one as a fall back position. Another optimal situation is to have higher-end machines with multiple processors and large amounts of memory. Multiple processors, in most cases, will increase software costs a considerable amount. If performance and high application traffic are going to be issues, then a clustered server environment should be considered.

## **8. Administrative / Management Requirements**

Management concerns will involve technical support, system maintenance and, of course, human resource management issues of a technical product. These issues are minimal if the maintenance and hosting of the application are contracted to a GIS application development and hosting organization. Technical and administrative issues become more critical and consuming when developing and/or hosting an application in-house. General expertise in GIS is suggested if outsourcing application development and hosting. In-house application development and hosting will require GIS specialist human resources, advanced web programming human resources, and significant technical material resources (hardware/software).

Management of an economic development sites and buildings inventory application should be concerned with data development, application development and system maintenance. A manager should be well experienced in project management regarding technical resources, human resources and multi-faceted disciplines.

The data required for this application typically already exists at the state or local levels. The manager must be tasked with obtaining the necessary data from these respective organizations, and developing a repeatable process for updating/uploading the information to the specified application data source. The

critical process is to link these tabular records to their corresponding geographic feature.

## 9. Cost – Cost/Benefit

### Costs:

The cost of developing a sites and buildings inventory application could range from \$25,000 to \$100,000 depending upon the functionality, use, and the outsourcing of components involved.. See below for an approximate and general breakdown of costs that may be incurred when developing an application in-house. Please note that the figures below are very general and basic estimations.

#### Hardware Costs: (Assuming Internet Deployment)

Item	Units	Cost	Total
Development Server	1	2,500	2,500
Production Server	1	5,000	5,000
GPS Units	3	1,000	3,000
Back-up System	1	3,500	3,500
Router	1	2,500	2,500
CSU/DSU	1	500	500
Dedicated Bandwidth	12	1,000	12,000
UPS for Computers	2	250	500
<b>Total</b>			<b>29,500</b>

#### Software Costs: (Assuming single processor based licensing)

Item	Units	Cost	Total
Operating System	1	1,000	2,500
Database Server	1	4,500	4,500
Map Server	1	7,500	7,500
Application Server	1	1,500	1,500
Java Server	1	1,000	1,000
Desktop GIS Package	2	1,500	3,000
Program Editor	1	650	650
<b>Total</b>			<b>20,650</b>

#### In-House Development Human Resource Costs:

(Assuming Internet Deployed Application and 6 month development cycle)

Item	Man/Hours	Utilization over 6 months	Hourly Cost	Total
GIS Specialist/Technician	360	35%	17.5	6,300
Field Personnel/Research	240	24%	15	3,600

Network/System Admin	240	24%	25	6,000
Programmer(s)	1000	100%	35	35,000
Manager	140	14%	25	3,500
<b>Total<sup>1</sup></b>				<b>54,400</b>

**On-going Application Maintenance/Enhancements (after development):**  
(Assuming Internet Deployed Application over 12 months )

Item	Man/Hours	Utilization over 6 months	Hourly Cost	Total
GIS Specialist/Technician	320	15%	17.5	5,600
Network/System Admin	156	7.5%	25	3,900
Programmer(s)	450	22%	35	15,750
Manager	156	7.5%	25	3,900
<b>Total<sup>1</sup></b>				<b>29,150</b>

**On-going Application Hosting (after development):**  
(Assuming Internet Deployed Application over 12 months )

Item	Units	Unit Cost	Total
Dedicated Bandwidth	12	1,000	12,000
<b>Total</b>			<b>12,000</b>

<sup>1</sup> Please note that the above human resources are rough estimates of hours for man-hours needed to perform some data collection and data development processes as well as the application development process. If the above human resources are not currently on staff and available for a project of this nature then resources would need to be acquired, most likely on a full-time basis. This is not feasible unless there is sufficient cause and workload to occupy these human resources for the additional hours above the utilization column above.

**Cost/benefit:**

As indicated from the above estimates, developing the initial application could range in the 100,000-dollar range. On-going maintenance, enhancements and hosting could be in the 45,000-dollar range. Out-sourcing the development and hosting functions to a qualified/experienced applications development firm could realistically cut the initial development costs by 50% and cut the ongoing maintenance and hosting costs by 75%.

The cost/benefit is highly favorable. The benefit to the economic development region is somewhat intangible, yet positive in the form of providing improved public and business service and in increasing positive perception of a local



government's or region's credibility, innovation and willingness to accommodate new business in the area.

It is likely that an application of this nature, publicly available over the Internet, may introduce the region to a potential business looking to locate an entity or division in the area that otherwise may not have considered the area. The tax base revenues from one such medium sized business may very well pay for the initial development costs.

## **10. Standards / Guidelines Summary**

This application will most likely be used to evaluate more than one specific county or locality since economic development regions typically expand beyond a single locality. Buildings and sites inventory should include available locations beyond a single locality and will require some research and data collection that will involve localities, local realtors, chambers of commerce and others.

All GIS or Spatial data should be delivered, collected or developed in a format and projection that matches the VBMP ortho base map. The attribute, or tabular data, provided by 3<sup>rd</sup> party entities should be in a standard database format, spreadsheet format or ASCII delimited text file format.

When and where possible approach the application development process in phases. This type of application will be very data centric or rely on data a great deal for usefulness to the intended user. Develop a basic database application as a first step and then add the mapping functionality in a separate phase and then add administrative and "back-end" functions in a later phase. This process will help keep the project manageable and allow for dispersed budgeting.

## **11. Startup Procedures/Steps**

- Application Outline / Blueprint: Application purpose, interface design, functionality, queries and "look and feel" should be determined and documented as an initial step. Stakeholders should be involved in this step.
- Data Acquisition: The attribute data should be obtained from the various sources mentioned earlier and normalized and related where necessary. Spatial data can be downloaded from a variety of sources listed above. If spatial data is not available then it will need to be collected and developed.
- Sourcing Determination: Determine entity/entities that will be performing data development functions, application development functions and application hosting functions and create a project plan with budget numbers.
- Develop a implementation plan that includes timelines and milestones.

- Develop a data development/transformation plan that includes meta data definitions, database schema, and data dictionaries with relational information.
- Re-address your project plan, timelines and budgets as a final initial process before committing resources.
- It is recommended that the database application functions be addressed and implemented before the mapping functions.

## 12. Estimated Time Line and/or Implementation (stand alone) schedule

The estimated time to develop this application varies based on functionality. This can be as little as three months, to as much as 12 months. Typically this type of application can be developed in approximately 6 months. Data collection and development functions will add to the time line. A sample timeline may if offered below as a generic applications development cycle.

Function	Time
Data collection/Research	3 months
Data development	1 month
Application Planning/Documentation	1 month
Application development	6 months
Application staging/testing	1 month
<b>Total time line</b>	<b>12 months</b>

### Best Practice Example in Virginia:

The Virginia Economic Development Partnership has implemented one of the best examples of an economic development sites and buildings inventory application for Virginia. The application covers the whole state and has a good bit of framework and base map data available to users. The application can be seen at <http://www.yesvirginia.org/vascan.asp>. For more information concerning this application please contact Jean Tingler at (804) 371-0340 or [jtingler@vedp.state.va.us](mailto:jtingler@vedp.state.va.us).